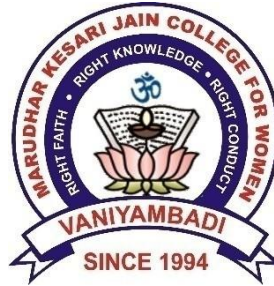


Marudhar Kesari Jain College for Women (Autonomous)
Vaniyambadi

Regulations 2026 - 2027



Master of Computer Applications (MCA)

Course Code	Course Category	Title of the Course	Ins. Hrs/Week	Credit	Marks		Total
					CIA	ESE	
Semester – I							
26PCAC11	Core – 1	Advanced Java Programming	6	5	25	75	100
26PCAC12	Core – 2	Python Programming	6	5	25	75	100
26PCAC13P	Core – 3	Advanced Java Programming Lab	5	3	25	75	100
26PCAE11/ 26PCAE12	DCE – 1	1. Database Management Systems/ 2. Full Stack Development	5	3	25	75	100
26PCAE13/ 26PCAE14	DCE – 2	1. Discrete Mathematics/ 2. Fuzzy Mathematics	4	3	25	75	100
26PCAA11	AECC-1	Software Project Management	2	2	25	75	100
26PCHR11	HR	Human Rights	2	2	25	75	100
			30	23	175	525	700
Semester – II							
26PCAC21	Core – 4	Operating Systems	6	5	25	75	100
26PCAC22	Core – 5	Mobile Application Development	6	5	25	75	100
26PCAC23P	Core – 6	Operating Systems Lab	5	3	25	75	100
26PCAE21/ 26PCAE22	DCE – 3	1. Social Media Analytics/ 2. Cyber Security	5	3	25	75	100
26PCAE23/ 26PCAE24	DCE – 4	1. Big data Analytics/ 2. Cryptography & Information Security	5	3	25	75	100
26PCAS21	SEC-1	Advanced Web Technologies	3	2	25	75	100
			30	21	150	450	600
Semester – III							
26PCAC31	Core – 7	Machine Learning	6	5	25	75	100
26PCAC32	Core – 8	R Programming	6	5	25	75	100
26PCAC33P	Core – 9	Machine Learning using R Programming Lab	6	4	25	75	100
26PCAE31/ 26PCAE32	DCE – 5	1. Research Methodology/ 2. Design and Analysis of Algorithm	6	3	25	75	100
26PCAS31	SEC – 2	Open-Source Computing	3	2	25	75	100
26PCAIK31	IKS*	Machine Learning Ethics & Law	3		25	75	100
26PCAIN31	Internship			2	25	75	100
			30	21	175	525	700
Semester – IV							
26PCAC41	Core –10	Data Analytics & Visualization	6	5	25	75	100
26PCAC42	Core – 11	Natural Language Processing	6	5	25	75	100
26PCAC43P	Core – 12	Data Analytics & Visualization Lab	4	3	25	75	100
26PCAC44P	Core – 13	Project	6	6	25	75	100
26PCAE41/ 26PCAE42	DCE – 6	1. Cloud Computing/ 2. Soft Computing	4	3	25	75	100
26PCAP41	PEC	Enterprises Resource Planning	2	2	25	75	100
26PCAL41	SLC	Devops	2	2	25	75	100
	MOOC	NPTEL (Online)			25	75	100
			30	26	200	600	800
			120	91	700	2100	2800

Students must complete at least one online course (MOOC) from platforms like SWAYAM, NPTEL, within the third semester. Additionally, engaging in a specified Self-learning Course is mandatory to qualify for the degree, and successful participation will be acknowledged with an extra credit of 2*.

CC: Core Course

SEC: Skill Enhancement Course

SLC: Self Learning Course

AECC: Ability Enhancement Compulsory Course

DCE: Discipline Centric Elective

PEC: Professional Enhancement Course

IKS: Indian Knowledge System (Non- Credit Course)

Department of Computer Applications		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCAC11	Advanced Java Programming	3	1	2	5	6	25	75	100
Category	Core Course	Theory&Problem							
Learning Objectives									
LO1	To understand the structure and working of AWT architecture								
LO2	To develop GUI applications using Swing components								
LO3	To enhance knowledge of event handling mechanisms								
LO4	To understand database connectivity using JDBC								
LO5	To understand server-side programming using Servlets								
Unit	Content								Hours
1	Java GUI with AWT-AWT Architecture- Components: Component, Container Window, Frame, Panel- AWT Controls: Label, Button, Checkbox- Text Field, Text Area- Scrollbar- Layout Managers: Flow Layout, Border Layout, Grid Layout, Card Layout Event Handling: Delegation Event Model Event Classes & Listener Interfaces Mouse & Action Events								16
2	Swing Framework- Introduction to Swing- Differences between AWT and Swing - Swing Components: JFrame, JApplet JLabel (Icons) JTextField, JComboBox JButton Advanced Components: JTabbedPane- JTable -JTree JScrollPane- JProgressBar – ToolTips								14
3	Advanced Event Handling - Adapter Classes- Remote Method Invocation (RMI): - Architecture - Creating Remote Interfaces - Stubs & Skeletons Remote Object Activation - Introduction to Java Spaces								16
4	JDBC Architecture - Drivers & Connectivity - Statements: Statement – Prepared Statement – Callable Statement - ResultSet Handling – Transactions - Joins & Data Retrieval - Database Integration in Applications								14
5	Servlet Lifecycle- Handling HTTP Requests & Responses - Writing Response Headers - Session Tracking: Cookies – Http Session - Introduction to JSP MVC Architecture Basics								15
K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create									
CO	Course Outcomes- On the successful completion of the course, students will be able to:								Knowledge Level
1	Design basic GUI applications using AWT components								K1-K6

2	Develop platform-independent GUI applications using Swing	K1-K6
3	Implement advanced event handling techniques	K1-K6
4	Establish database connections using JDBC drivers	K1-K6
5	Implement session management using cookies and sessions	K1-K6

Text books:	
1	Herbert Schildt, “Java the Complete Reference”, 10th edition, McGraw Hill Publishing Company Ltd, New Delhi, 2017.
2	Tony Goddis, “Starting out with Java from Control Structures Through Objects” 6th Edition, Pearson Education Limited, 2016
3	Uttam K. Roy, “Advanced Java Programming”, Oxford University press, 2015.
Reference Books:	
1	Herbert Schildt, Dale Skrien, “Java Fundamentals – A Comprehensive Introduction”, TMGH Publishing Company Ltd, New Delhi, 2013
2	John Dean, Raymond Dean, “Introduction to Programming with JAVA – A Problem Solving Approach”, TMGH Publishing Company Ltd, New Delhi, 2012.
Web Resources:	
1	https://nptel.ac.in/
2	https://www.coursera.org/
3	https://www.edx.org/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	1	3		-	-	3	2	1
CO2	3	3	3	2	3		-	-	3	3	1
CO3	2	3	2	2	3	1	-	-	2	2	3
CO4	3	3	3	2	3	1	-	-	3	3	2
CO5	3	3	3	2	3	1	-	-	3	3	2
Total	15	14	13	9	15	3	-	-	14	13	9
Average	3	2.8	2.6	1.8	3	1	-	-	2.8	2.6	1.8

3 – Strong, 2- Medium, 1- Low

Department of Computer Applications		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCAC12	Python Programming	3	1	2	5	6	25	75	100
Category	Core Course	Theory & Problem							
Learning Objectives									
LO1	Understand the fundamental concepts, syntax, and features of Python programming.								
LO2	Apply core programming constructs including functions, data structures, and exception handling to solve basic problems.								
LO3	Develop object-oriented Python programs and perform file operations for real-world data management tasks.								
LO4	Utilize Python packages such as NumPy, Pandas, and Matplotlib for data processing and visualization.								
LO5	Build interactive applications using GUI frameworks and web development using Django								
Unit	Content								Hours
1	Introduction to Python: History - Features of Python - Installing Python: IDLE and other IDEs - Executing Python scripts. Python Basics: Variables, - Keywords - Indentation - Comments and Documentation Strings. Data Types – Typecasting – Operators - Control Flow Statements: if, if-else, if-elif-else - while and for loops - Loop Control Statements: break, continue, pass statements.								18
2	Functions, Strings, Lists & Dictionaries: Functions: Defining and calling functions- Function arguments- Return statement- Recursion-Lambda, map(), filter(), reduce(). Modules and Packages: Importing modules -Creating user-defined modules Standard Python modules .Exception Handling: try, except, else, finally-Built-in exceptions- Raising exceptions. Strings-Lists and Tuples: Dictionaries -Sets: Set operations and methods-Frozen set.								18
3	Object-Oriented Programming and File Handling: Object-Oriented Programming: Classes and Objects-__init__ method- Instance and class variables Methods -Inheritance – Polymorphism-Encapsulation. File Handling: Opening/closing files Reading and writing files -File modes - File methods -Using with statement.								18
4	Python Packages and Data Visualization: Working with Python Packages: NumPy Library- Ndarray – Basic Operations – Indexing, Slicing and Iteration – Array manipulation - Pandas –The Series – The Data Frame – The Index Objects – Data Visualizations with Matplotlib – The Matplotlib Architecture – pyplot –The Plotting Window – Adding Elements to the Chart – Line Charts – Bar Charts – Pie charts.								18
5	Graphical User Interfaces: Graphical User Interfaces - The Behavior of terminal-Based programs-and GUI-Based programs - Coding Simple GUI-Based programs - Windows and Window Components - Command Buttons and responding to events-Django: Installing Django – Building an Application – Project Creation – Designing the Data Schema.								18

K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create		
CO	Course Outcomes- On the successful completion of the course, students will be able to:	Knowledge Level
1	Demonstrate proficiency in Python syntax, control structures, and script execution.	K1
2	Design and implement Python programs using functions, lists, dictionaries, and built-in modules	K2
3	Apply object-oriented principles to develop structured and reusable code.	K3
4	Analyze and visualize data using NumPy, Pandas, and Matplotlib libraries.	K4
5	Create basic GUI applications and simple web applications using Django framework.	K5-K6

Text books:	
1	Mark Lutz, “Learning Python”, O’Reilly Media, 2009.
2	Fabio Nelli, Python Data Analytics: With Pandas, NumPy, and Matplotlib, Second Edition, Kindle Edition, 2018.
3	Antonio Mele, “Django 3 By Example”, Third Edition, 2020.
Reference Books:	
1	Reema Thareja, “Python Programming: Using Problem Solving Approach“, Oxford University Press
2	Kenneth A. Lambert, “Fundamentals of Python: First Programs”, 3rd Edition, Cengage Learning, 2024.
3	Alan D. Moore, “Python GUI Programming with Tkinter”, 2nd Ed., Packt, 2022.
Web Resources:	
1	https://www.tutorialspoint.com/python/python_pdf_version.htm
2	https://nptel.ac.in/courses/106106212
3	https://swayam.gov.in/nd1_noc20_cs46/preview

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	2		1	1	3	2	1
CO2	3	3	2	2	3		1	1	3	2	1
CO3	3	3	3	2	3		2	1	3	2	2
CO4	3	3	3	3	3	1	1	1	2	3	3
CO5	3	3	3	2	3	1	2	2	3	3	2
Total	15	14	12	10	14	2	7	6	14	12	9
Average	3	2.8	2.4	2	2.8	0.5	1.4	1.2	2.8	2.4	1.8

3 – Strong, 2- Medium, 1- Low

Department of Computer Applications		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCAC13P	Advanced Java Programming Lab	0	0	5	3	5	25	75	100
Category	Core Course	Theory & Problem							
Learning Objectives									
LO1	To understand the structure and working of AWT architecture								
LO2	To develop GUI applications using Swing components								
LO3	To enhance knowledge of event handling mechanisms								
LO4	To understand database connectivity using JDBC								
LO5	To understand server-side programming using Servlets								
Sno	Content								Hours
1	Develop a student registration form using AWT.								75
2	Write a program to change background color on button click.								
3	Design a login form using: JLabel, JTextField, JButton.								
4	Create a Swing application using JFrame .								
5	Write a program to handle mouse events using adapter class.								
6	Demonstrate remote method invocation for calculator operations .								
7	Connect Java program to database using JDBC.								
8	Implement transaction handling and resultset								
9	Develop a simple JSP page for login form .								
10	Implement session tracking using Cookies and HttpSession .								
K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create									
CO	Course Outcomes- On the successful completion of the course, students will be able to:								Knowledge Level
1	Design basic GUI applications using AWT components								K1, K2
2	Develop platform-independent GUI applications using Swing								K3
3	Implement advanced event handling techniques								K4, K5
4	Establish database connections using JDBC drivers								K3
5	Implement session management using cookies and sessions								K2

Text books:	
1	Herbert Schildt, “Java the Complete Reference”, 10th edition, McGraw Hill Publishing Company Ltd, New Delhi, 2017.
2	Tony Goddis, “Starting out with Java from Control Structures Through Objects” 6th Edition, Pearson Education Limited, 2016
Reference Books:	
1	Herbert Schildt, Dale Skrien, “Java Fundamentals – A Comprehensive Introduction”, TMGH Publishing Company Ltd, New Delhi, 2013
2	John Dean, Raymond Dean, “Introduction to Programming with JAVA – A Problem Solving Approach”, TMGH Publishing Company Ltd, New Delhi, 2012.
Web Resources:	
1	https://nptel.ac.in/
2	https://www.coursera.org/
3	https://www.edx.org/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	1	3		1	1	3	2	1
CO2	3	3	3	2	3		2	2	3	3	1
CO3	3	3	2	2	3	1	1	1	2	2	3
CO4	3	3	3	2	3	1	1	1	3	3	2
CO5	3	3	3	2	3	1	2	2	3	3	2
Total	15	14	13	9	15	3	7	7	14	13	9
Average	3	2.8	2.6	1.8	3	1	1.4	1.4	2.8	2.6	1.8

3 – Strong, 2- Medium, 1- Low

Department of Computer Applications		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCAE11	Database Management Systems	3	0	2	3	5	25	75	100
Category	Core Course	Theory & Problem							
Learning Objectives									
LO1	Understand the basic concepts of databases and DBMS.								
LO2	Design ER diagrams for real-world database applications.								
LO3	Apply relational algebra to formulate database queries.								
LO4	Use INSERT, DELETE, UPDATE operations and constraints in SQL.								
LO5	Understand functional and multivalued dependencies in database design.								
Unit	Content								Hours
1	Introduction to Databases: Introduction, Characteristics of database approach, Advantages of using the DBMS approach, History of database applications. Overview of Database Languages and Architectures: Data Models, Schemas, and Instances. Three schema architecture and data independence, database languages, and interfaces, The Database System environment. Conceptual Data Modelling using Entities and Relationships: Entity types, Entity sets, attributes, roles and structural constraints, Weak entity types, ER diagrams.								15
2	Relational Model: Relational Model Concepts, Relational Model Constraints and relational database schemas, Update operations, transactions, and dealing with constraint violations. Relational Algebra: Unary and Binary relational operations, additional relational operations (aggregate, grouping, etc.) Examples of Queries in relational algebra.								15
3	SQL: SQL data definition and data types, specifying constraints in SQL, retrieval queries in SQL, INSERT, DELETE, and UPDATE statements in SQL, Additional features of SQL. Advanced Queries: More complex SQL retrieval queries, Specifying constraints as assertions and action triggers, Views in SQL.								15
4	Normalization: Introduction to Normalization using Functional and Multivalued Dependencies: Informal design guidelines for relation schema, Functional Dependencies, Normal Forms based on Primary Keys, Second and Third Normal Forms, Boyce-Codd Normal Form, Multivalued Dependency and Fourth Normal Form.								15
5	Transaction Processing: Introduction to Transaction Processing, Desirable properties of Transactions, Characterizing schedules based on Recoverability and Serializability, Transaction support in SQL. Concurrency Control in Databases: Two-phase locking techniques for Concurrency control, Concurrency control based on Timestamp ordering, Multi version Concurrency control techniques, Validation Concurrency control techniques.								15
K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create									

CO	Course Outcomes- On the successful completion of the course, students will be able to:	Knowledge Level
1	Explain the fundamental concepts of databases, DBMS architecture, and database languages.	K1, K2
2	Design conceptual database models using ER diagrams for real-world applications.	K1, K2
3	Apply the relational model and relational algebra operations to query relational databases.	K2, K3
4	Develop and execute SQL queries for database creation, manipulation, and advanced data retrieval.	K2, K3, K4, K6
5	Analyze database normalization, transaction processing, and concurrency control mechanisms to ensure database integrity and consistency.	K2, K3, K4, K5

Text books:

1	Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database System", 7th Edition, Pearson, 2017.
2	Abraham Silberschatz, Henry F. Korth, S. Sudarshan, "Database System Concepts", 2020, 7th Edition, McGraw Hill.
3	Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", 2007, 3rd Edition, McGraw Hill.
4	Ramakrishnan and Gehrke, "Database Management Systems", 3rd Edition, McGraw Hill, 2014
5	Gupta G K, —Database Management Systems, Tata McGraw Hill, New Delhi, 2011.

Reference Books:

1	AtulKahate, —Introduction to Database Management Systems, Pearson Education, New Delhi, 2009.
2	C.J. Date, A. Kannan, S. Swamynathan, "Introduction to Database Systems", Pearson Education, Eighth Edition 2006.
3	Rini Chakrabarti, Shilbhadra Dasgupta, "Advanced Database Management System", DreamTech Press, 2014.

Web Resources:

1	Database Management System, https://nptel.ac.in/courses/106105175
2	Fundamentals of Database Systems, https://nptel.ac.in/courses/106104135
3	Create Your First NoSQL Database with MongoDB and Compass, https://www.coursera.org/projects/nosql-database-with-mongodb-and-compass

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	1	1	2				2	2	1
CO2	3	2	2	2	3				3	3	2
CO3	3	3	3	2	2				3	3	2
CO4	3	3	2	3	2	1			2	2	3
CO5	3	3	3	2	3	1		1	3	3	3
Total	15	14	11	10	12	2		1	13	13	11
Average	3	2.8	2.2	2	2.4	0.4		0.2	2.6	2.6	2.2

3 – Strong, 2- Medium, 1- Low

Department of Computer Applications		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCAE12	Full Stack Development	3	0	2	3	5	25	75	100
Category	Core Course	Theory & Problem							
Learning Objectives									
LO1	To understand the fundamentals of modern web development using HTML5, CSS3, and JavaScript .								
LO2	To develop interactive and responsive user interfaces using React and modern front-end practices.								
LO3	To build scalable server-side applications using Node.js and Express.js .								
LO4	To learn enterprise-level web development using Spring Framework and MVC architecture.								
LO5	To understand reactive programming and develop dynamic applications using Angular .								
Unit	Content								Hours
1	Introduction to HTML5 - Headings, Linking, Images, Lists, Tables, Forms, New HTML5 Form Input Types, Page Structure Elements - Introduction to CSS - Inline Styles, Embedded Style Sheets, Linking External Style Sheets, Backgrounds, Element Dimensions, Box Model and Text Flow, Positioning, Media Types and Media Queries, Drop Down Menus Selectors, Text Shadows, Box Shadows- JavaScript - Introduction, Operators - Control Statements - Functions, Dialog boxes - Arrays - Objects - Document Object Model - JavaScript Event Handling, Form Processing - Ajax – JSON.								16
2	Environment Set up – JSX – React DOM – Props – State – Controlled Components – Custom Hooks – Reusable React Component – Conditional Rendering – Advanced and Impossible States – Fetching and Re-fetching – Async/Await – Styling in React- React Routers- Server Rendering - Authentication and Authorization - Deployment – Mongoose and Redux libraries								15
3	Getting Started with Node.js Installing Node.js, Working with Node Packages, Creating a Node.js Application - Using Events, Listeners, Timers, and Callbacks in Node.js - Implementing Event emitter, Implementing Callbacks - Accessing the File System from Node.js - Implementing HTTP Services in Node.js - Saving Time with Express - The Request and Response Objects - Form Handling - Sending Client Data to Server, Form Handling with Express - Cookies and Sessions – Middleware Function Calls								15
4	Java Web Development: JAVA PROGRAMMING BASICS, Model View Controller (MVC) Pattern MVC Architecture using Spring RESTful API using Spring Framework Building an application using Maven								15
5	Reactive Development Paradigm – Advanced Angular Architecture – Setting up your Development Environment – Creating basic Angular App – Developing high quality UX with Angular Material – Forms Observables and Subjects.								14
K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create									

CO	Course Outcomes- On the successful completion of the course, students will be able to:	Knowledge Level
1	Apply styling, layouts, and responsive design using CSS including media queries and box model.	K1, K2
2	Implement DOM manipulation, event handling, form validation, and asynchronous communication using AJAX and JSON.	K2, K3
3	Develop backend applications using Node.js.	K3, K4
4	Apply MVC architecture using Spring Framework.	K3, K4
5	Implement reactive programming concepts such as observables and subjects.	K3, K4

Text books:

1	Philip Ackermann, <i>Full Stack Web Development: Mastering Web Development from Client to Server-Side Technologies</i> , Packt Publishing, 2024.
2	Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by-Step Guide to Creating Dynamic Websites by Robin Nixon
3	Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB. Copyright © 2015 BYAZAT MARDAN

Reference Books:

1	<i>Frank Zammetti, Modern Full-Stack Development, Apress, 2022.</i>
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Web Resources:

1	https://nptel.ac.in/courses/106105175
2	https://www.w3schools.com/sql/
3	https://dev.mysql.com/doc/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	1	3	1	1		3	3	1
CO2	3	2	3	2	3	2	2		3	2	2
CO3	3	3	3	2	3	2	2		3	3	2
CO4	3	3	3	3	3	2	2	1	3	3	3
CO5	3	3	3	3	3	3	3	1	3	3	3
Total	15	14	14	11	15	10	10	2	15	14	11
Average	3	2.8	2.8	2.2	3	2	2	0.4	3	2.8	2.2

3 – Strong, 2- Medium, 1- Low

Department of Mathematics		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCAE13	Discrete Mathematics	2	1	1	3	4	25	75	100
Category	Core Course	Theory-60 & Problem-40							
Learning Objectives									
LO1	To explain the fundamentals of recurrence relations, polynomials, and generating functions.								
LO2	To analyse logical statements using connectives, construct accurate truth tables and tautologies.								
LO3	To describe the basic concepts of graph theory and their practical applications.								
LO4	To illustrate matrix representation of graphs and examine the properties of trees.								
LO5	To apply concepts of spanning trees and shortest path algorithms in graph-based problems.								
Unit	Content								Hours
1	Recurrence Relations and Generating Functions: Recurrence-an introduction – Polynomials and their Evaluations – Recurrence Relations - Generating Functions. Chapter-V : Sec 5.1 to 5.3 and 5.6.								12
2	Logic: Introduction - TF Statements – Connectives – Atomic and Compound Statements – Well Formed Formulae - Truth Table of a Formula – Tautology – Tautology Implication and Equivalence of Formulae. Chapter - IX : Sec 9.1 to 9.8								12
3	Graph Theory: Basic Concepts - Incidence and Degree - Sub-graph - Graph Isomorphism - Some Special Classes of Graphs - Path, Cycle and Connectedness. Chapter - XI : Sec 11.1								12
4	Graph Theory (Continue...): Matrix Representation of Graphs – The Adjacency Matrix of an Undirected Graphs - Path Matrix- Warshall Algorithm - Incidence Matrix of a Digraph - Trees - Centers in a Tree - Fundamental Circuits. Chapter - XI : Sec 11.2 and 11.3.								12
5	Graph Theory (Continue...): Spanning Trees Minimum Spanning Tree – Kruskal’s Algorithm - PRIM’S Algorithm - Shortest Path Problem. Chapter - XI : Sec 11.4 and 11.5.								12
CO	Course Outcomes								Knowledge Level
	The students will be able to								
1	Solve problems involving recurrence relations and apply generating functions effectively								K1, K2, K3, K4
2	Construct and evaluate logical expressions using truth tables, logical connectives and identify tautologies.								K1, K2, K3, K4

3	Explain and apply basic graph theory concepts in problem-solving.	K1, K2, K3, K4
4	Represent graphs using matrices and analyse tree structures.	K1, K2, K3, K4
5	Apply graph algorithms to find spanning trees and shortest paths.	K1, K2, K3, K4

Textbooks:	
1	M. K. Venkataraman, N. Sridharan, N. Chandrasekaran, Discrete Mathematics, The National Publishing Company, Chennai, 2007.
Reference Books:	
1	J.P. Tremblay and R. Manohar, Discrete Mathematical Structures with Applications to Computer Science, Tata McGraw Hill, 2002.
2	Kenneth H. Rosen Discrete Mathematics and applications, McGraw Hill, New York, 2012.
3	Joe L. Mott, Abraham Kandel and Theodore P. Baker, Discrete Mathematics for Computer Scientists & Mathematicians, 2nd Edition, Prentice Hall of India Private Limited, New Delhi, 2008.
4	J.L. Gersting, Mathematical Structures for Computer Science, 3 rd Edn., Computer Science Press, New York.
5	S. Wiitala, Discrete Mathematics – A Unified Approach, McGraw Hill Book Co, New Delhi, 2003.
Web Resources:	
1	https://nptel.ac.in/courses/106106094
2	https://nptel.ac.in/courses/111107058

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	2	3	3	3	3	3	3
CO2	3	3	3	2	2	3	2	2	3	3	2
CO3	3	2	3	3	3	3	3	3	3	2	2
CO4	2	2	3	2	2	3	3	2	3	3	3
CO5	2	3	2	3	3	2	3	3	3	2	3
Total	13	13	14	13	12	14	14	13	15	13	13
Average	2.6	2.6	2.8	2.6	2.4	2.8	2.8	2.6	3	2.6	2.6

3 – Strong, 2- Medium, 1- Low

Department of Mathematics		L	T	P/S	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCAE14	Fuzzy Mathematics	2	1	1	3	4	25	75	100
Category	DCE	Theory 80% & Problem 20%							
Learning Objectives									
LO1	To know the basic concepts of fuzzy logic.								
LO2	To explore the operations on fuzzy sets.								
LO3	To study Fuzzy relations.								
LO4	To understand decision making in Fuzzy environments.								
LO5	To constrain the applications of fuzzy logic in various fields.								
Unit	Content							Hours	
1	Overview of Classical Sets, Membership Function, Height of a fuzzy set– Normal and subnormal fuzzy sets – Support – Level sets, fuzzy points, α -cuts – Decomposition Theorems, Extension Principle.							12	
2	Standard fuzzy operations – Union, intersection and complement–properties De Morgan's laws – fuzzy sets – Support – Level sets, fuzzy points, α -Cuts of fuzzy operations.							12	
3	Cartesian Product, Crisp relations – cardinality – operations and properties of Crisp and Fuzzy relations. Image and inverse image of fuzzy sets – Various definitions of fuzzy operations – Generalizations – Non interacting fuzzy sets, Tolerance and equivalence relations.							12	
4	Decision making in Fuzzy environments General Discussion – Individual Decision making – multi person decision making – multi criteria decision making – multi Stage decision making–fuzzy ranking methods – fuzzy linear programming.							12	
5	Applications Medicine – Economics – Fuzzy Systems and Genetic Algorithms – Fuzzy Regression – Inter personal Communication – Other Applications.							12	
CO	Course Outcomes							Knowledge Level	
The Students will be able to									
1	Understand the basic concepts of fuzzy logic and Extension Principle.							K2, K3, K4	
2	Analyze support, level sets, fuzzy points, α - cuts, and apply fuzzy operations.							KI, K3, K4	
3	Learn Fuzzy relations.							KI, K2, K4	
4	Know the decision making in Fuzzy environments.							KI, K2, K3,	
5	Apply the applications of fuzzy logic in various fields.							KI, K2, K3, K4	

Recommended Text book:	
1	G.J. Klir and Bo Yuan, Fuzzy Sets and fuzzy Logic Theory and Applications, Prentice Hall of India Ltd., New Delhi,2005
Reference Books:	
1	George J. KlirandBo Yuan, Fuzzy sets and Fuzzy Logic Theory and Applications, PHI Learning Private Limited, New Delhi 2009.
2	A.K. Bhargava, Fuzzy Set Theory, Fuzzy Logic and their Applications, published by S. Chand Pvt. Limited 2013.
3	K. Pundir and R. Pundir, Fuzzy sets and their application, Published by A Pragati Edition 2012
4	H.J. Zimmermann, Fuzzy set theory and its applications, Springer, 2012.
5	Bhargava A.K, Fuzzy Set Theory, Fuzzy Logic and their Application, 1987.
Web Resources:	
1	http://mathforum.org , http://ocw.mit.edu/ocwweb/Mathematics , http://www.opensource.org ,
2	https://www.nature.com/research-intelligence/nri-topic-summaries/fuzzy-decision-making-and-multi-criteria-analysis-micro-1056

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	3	3	3	3	3	3	3	3	3
CO2	3	2	2	2	2	2	2	2	3	2	2
CO3	3	3	3	2	3	3	3	3	3	3	3
CO4	3	2	3	3	3	2	3	3	2	2	2
CO5	3	2	3	3	3	3	3	3	3	3	3
Total	15	12	14	13	14	13	14	14	14	13	13
Average	3	2.4	2.8	2.6	2.8	2.6	2.8	2.8	2.8	2.6	2.6

3 – Strong, 2- Medium, 1- Low

Department of Computer Applications		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCAA11	Software Project Management	2	0	0	2	2	25	75	100
Category	Core Course	Theory & Problem							
Learning Objectives									
LO1	Understand the fundamentals of Software Project Management , including project planning, estimation, and decision-making processes.								
LO2	Learn techniques for project organization, scheduling, and work breakdown structures to manage software development activities effectively.								
LO3	Understand project monitoring and control mechanisms , including earned value analysis and software review techniques.								
LO4	Gain knowledge of software configuration management, change control, and risk management processes .								
LO5	Understand software quality management practices, quality assurance methods, and contract management in software projects .								
Unit	Content								Hours
1	Fundamentals of Software Project Management (SPM), Need Identification, Vision and Scope Document, Project Management Cycle, SPM Objectives SPM Framework, Software Project Planning, Planning Objectives, Project Plan, Types of Project Plan, Structure of a Software Project Management Plan-Software Project Estimation, Estimation Methods, Estimation Models, Decision Process.								6
2	Work Breakdown Structure (WBS), Types of WBS, Functions, Activities and Tasks, Project Life Cycle and Product Life Cycle- Ways to Organize Personnel, Project Schedule, Scheduling Objectives, Building the Project Schedule, Scheduling Terminology and Techniques- Network Diagrams: PERT, CPM, Bar Charts: Milestone Charts, Gantt Charts.								6
3	Dimensions of Project Monitoring & Control, Earned Value Analysis- Earned Value Indicators: Budgeted Cost for Work Scheduled (BCWS), Cost Variance (CV), Schedule Variance (SV), Cost Performance Index (CPI), Schedule Performance Index (SPI)- Software Reviews, Types of Review: Inspections, Desk checks, Walkthroughs, Code Reviews.								6
4	Software Configuration Items and Tasks, Baselines, Plan for Change, Change Control, Change Requests Management, Version Control- Risk Management: Risks and Risk Types, Risk Breakdown Structure (RBS), Risk Management Process: Risk Identification, Risk Analysis, Risk Planning, Risk Monitoring.								6
5	Concept of Software Quality, Software Quality Attributes, Software Quality Metrics and Indicators, The SEI Capability Maturity Model (CMM)- SQA Activities, Formal SQA Approaches: Proof of Correctness, Statistical Quality Assurance, Product versus process quality management- Introduction, types of contract, stages in contract, placement, typical terms of a contract, contract management, acceptance								6

K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create		
CO	Course Outcomes- On the successful completion of the course, students will be able to:	Knowledge Level
1	Explain the principles, framework, and lifecycle of software project management.	K2,K1
2	Apply project planning, estimation techniques, and scheduling methods for software development projects.	K4
3	Analyze project performance using monitoring techniques such as Earned Value Analysis and software reviews.	K6
4	Implement software configuration management, version control, and risk management strategies in projects.	K3
5	Evaluate software quality assurance practices, capability maturity models, and contract management in software projects.	K2

Text books:

1	Software Project Management, Author: Bob Hughes and Mike Cotterell, Publisher: McGraw-Hill Education, Edition: 6th Edition, Year: 2019
2	Software Project Management: A Unified Framework, Author: Walker Royce Publisher: Addison-Wesley
3	Software Engineering: A Practitioner's Approach, Author: Roger S. Pressman and Bruce R. Maxim, Publisher: McGraw-Hill Education, Edition: 9th Edition (2020)
4	Andrew Stellman and Jennifer Greene, <i>Applied Software Project Management</i> , O'Reilly Media.

Reference Books:

1	<i>Software Engineering</i> , Ian Sommerville , Pearson Education, 10th Edition (or latest edition)
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Web Resources:

1	https://www.tutorialspoint.com/software_engineering/index.html
2	https://www.javatpoint.com/software-engineering

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	1	2		1	1	2	3	2
CO2	3	3	2	2	2		2	1	2	3	2
CO3	3	3	2	3	2		2	1	2	3	3
CO4	3	3	2	2	2	1	2	1	2	3	3
CO5	3	3	3	2	2	1	3	2	2	3	3
Total	15	14	11	10	10	2	10	6	10	15	13
Average	3	2.8	2.2	2	2	0.4	2	1.2	2	3	2.6

3 – Strong, 2- Medium, 1- Low

SEMESTER II

Department of Computer Applications		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCAC21	Operating Systems	3	1	2	5	6	25	75	100
Category	Core Course	Theory & Problem							
Learning Objectives									
LO1	Understand the fundamental concepts of operating systems, including system types, structures, components, services, and system calls.								
LO2	Analyze process management techniques such as process scheduling, inter-process communication, CPU scheduling algorithms, and real-time scheduling.								
LO3	Apply synchronization mechanisms and deadlock handling strategies to ensure safe and efficient process execution in concurrent environments.								
LO4	Evaluate memory management techniques, including contiguous and non-contiguous allocation, paging, segmentation, and virtual memory concepts.								
LO5	Examine I/O systems and file management concepts, including disk scheduling, file system structure, allocation methods, and basic Linux commands and shell programming.								
Unit	Content								Hours
1	INTRODUCTION: Definition of OS-Mainframe System-Desktop Systems-Multi-processor System-Distributed-Clustered-Real time Systems-Handheld Systems-Operating System Structure System Components-Services-System Calls-System Programs-System Design and Implementation								18
2	PROCESS MANAGEMENT: Concepts-Process Scheduling-Operations on Processes Cooperating Processes-Inter Process Communication-CPU Scheduling-Scheduling Concepts Criteria-Scheduling Algorithms-Multiprocessor Scheduling-Real time Scheduling.								18
3	PROCESS SYNCHRONIZATION: Critical Section-Synchronization Hardware Semaphores Problems of Synchronization-Critical Regions-Monitors-Deadlocks Characterization-Handling Deadlocks-Deadlock Prevention – Avoidance-Detection-Deadlock Recovery.								18
4	MEMORY MANAGEMENT: Storage Hierarchy-Storage Management Strategies Contiguous Non Contiguous Storage Allocation-Single User-Fixed Partition-Variable Partition Swapping Virtual Memory-Basic Concepts-Multilevel Organization-Block Mapping-Paging Segmentation Page Replacement Methods-Locality-Working Sets.								18
5	I/O AND FILE SYSTEMS: Disk Scheduling-File Concepts-File System Structure-Access Methods-Directory Structure-Protection-Directory Implementation-Allocation Methods-Free Space Management Case Study: Linux Operating System – Commands, Shell Programming, Report writing								18
K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create									

CO	Course Outcomes- On the successful completion of the course, students will be able to:	Knowledge Level
1	Understand the design issues associated with operating systems	K1, K2
2	Master various process management concepts like scheduling, deadlock management	K2, K3
3	Analyze on memory management	K3, K4
4	Analyze about the disk performance optimization and file systems	K3, K4
5	Analyze on Linux operating system	K3, K4
Text books:		
1	Silberschatz and Galvin, Operating System Concepts, 6th Edition, John Wiley & Sons, Inc., 2019.	
2	Milankovic M., Operating System Concepts and Design, 2nd Edition, McGraw Hill, 2018.	
Reference Books:		
1	P.C.Bhatt, An Introduction to Operating Systems-Concepts and Practice, Prentice Hall of India, 2004.	
2	H.M.Deitel, An Introduction to Operating Systems, 2nd Edition, Pearson Education, 2002.	
Web Resources:		
1	https://www.javatpoint.com/os-tutorial	
2	https://www.tutorialspoint.com/operating_system/index.htm	
3	https://nptel.ac.in/courses/106/106/106106144/	

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	1	1	2	2	2	2
CO2	3	3	2	2	2	1	1	2	3	3	2
CO3	3	3	2	3	2	1	1	2	3	3	3
CO4	3	3	2	3	2	1	1	2	3	3	3
CO5	3	3	3	2	3	2	2	2	3	3	3
Total	15	14	10	11	11	7	7	10	14	14	13
Average	3	2.8	2	2.2	2.2	1.4	1.4	2	2.8	2.8	2.6

3 – Strong, 2- Medium, 1- Low

Department of Computer Applications		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCAC22	Mobile Application Development	3	1	2	5	6	25	75	100
Category	Core Course	Theory & Problem							
Learning Objectives									
LO1	To understand mobile application development ecosystems including Android, iOS, and hybrid platforms.								
LO2	To learn cross-platform app development using Flutter and programming with Dart .								
LO3	To design and develop responsive and user-friendly mobile interfaces using Flutter widgets and layouts.								
LO4	To implement application logic using state management techniques and navigation strategies.								
LO5	To integrate backend services, REST APIs, and local data storage in mobile applications.								
Unit	Content								Hours
1	Overview of mobile platforms (Android, iOS, hybrid) - Introduction to Flutter & Dart: Features, advantages, limitations - Flutter architecture, installation, and setup - First Flutter app: Structure and workflow								18
2	Dart syntax, variables, data types - Control structures: loops, conditionals - Functions, classes, OOP concepts in Dart - Error handling and debugging								18
3	Mobile UI Principles – UI Widgets: Stateless vs Stateful - Layouts: Single-child, multi-child, custom layouts - Theming and styling - User input, forms, and validation								18
4	State management approaches (setState, Provider, Riverpod, Bloc) - Navigation and routing - Data persistence: local storage (SQLite, Shared Preferences), file I/O - Integrating REST APIs and JSON parsing								18
5	Integrating AI/ML (using TensorFlow Lite, ML Kit) - CI/CD pipelines (GitHub Actions for Flutter) - Cloud integration (Firebase, AWS Amplify) - Testing, debugging, and performance optimization - App deployment: Play Store & App Store								18
K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create									
CO	Course Outcomes-								Knowledge Level
On the successful completion of the course, students will be able to:									
1	Apply mobile platforms (Android, iOS, hybrid) and compare their features and use cases.								K2
2	Apply object-oriented programming concepts and error handling techniques.								K1

3	Design mobile user interfaces using Flutter widgets (Stateless and Stateful).	K3
4	Implement state management using techniques such as setState, Provider, Riverpod, and Bloc.	K3
5	Manage data using local storage (SQLite, Shared Preferences, file handling).	K3
Text books:		
1	Eric Windmill, "Flutter in Action", Manning Publications, 2020.	
2	Rap Payne, "Beginning App Development with Flutter", Apress, 2025.	
3	Reto Meier, "Professional Android 2 Application Development", Wiley Publishing, Inc, First Edition, 2010.	
4	Reto Meier and Ian Lake, "Professional Android", Wrox A Wiley Brand, Fourth Edition, 2010.	
5	Wei-Meng Lee, "Beginning iPhone SDK Programming with Objective-C", Wrox Wiley, First Edition, 2010.	
Reference Books:		
1	Simone Alessandria, Flutter Cookbook: 100+ Step-by-Step Recipes for Building Cross Platform, Professional-Grade Apps with Flutter 3.10.x and Dart 3.x, Packt Publishing, 2023	
2	Alberto Miola, "Flutter Complete Reference 2.0", Independently Published, 2023	
3	Android Programming: Pushing the Limits, Erik Hellman, 1st Edition, Wiley Publications, 2014	
Web Resources:		
1	https://smartzworld.com/notes/mobile-application-development-notes-pdf-jntu/#google_vignette	
2	https://www.youtube.com/watch?v=qgzy1EEid0E	

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	1	3	1	1		3	2	1
CO2	3	3	2	2	3	1	1		3	3	2
CO3	3	3	3	2	3	2	2		3	3	2
CO4	3	3	3	3	3	2	2	1	3	3	3
CO5	3	3	3	3	3	3	3	1	3	3	3
Total	15	14	13	11	15	9	9	2	15	14	11
Average	3	2.8	2.6	2.2	3	1.5	1.5	0.4	3	2.8	2.2

3 – Strong, 2- Medium, 1- Low

Department of Computer Applications		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCAC23P	Operating Systems Lab	0	0	5	3	5	25	75	100
Category	Core Course	Theory & Problem							
Learning Objectives									
LO1	Understand the fundamental concepts of operating systems, including system types, structures, components, services, and system calls.								
LO2	Analyze process management techniques such as process scheduling, inter-process communication, CPU scheduling algorithms, and real-time scheduling.								
LO3	Apply synchronization mechanisms and deadlock handling strategies to ensure safe and efficient process execution in concurrent environments.								
LO4	Evaluate memory management techniques, including contiguous and non-contiguous allocation, paging, segmentation, and virtual memory concepts.								
LO5	Examine I/O systems and file management concepts, including disk scheduling, file system structure, allocation methods, and basic Linux commands and shell programming.								
Sno	Content								Hours
1	Implement the basic of UNIX/LINUX commands								75
2	To write a basic shell programming a. Hello World script b. Arithmetic operations								
3	Implementation of CPU scheduling a) Round Robin b) SJF c) FCFS								
4	To understand process management using commands ps, top, kill, etc.								
5	Implementation of Banker Algorithm for Deadlock Avoidance								
6	Implementation of an algorithm for deadlock detection								
7	Implementation of all page replacement algorithm a. FIFO b. LRU c. LFU								
8	To implementation of paging techniques of memory management								
9	Write a shell script to print contents of file from given line number to next given Number of lines.								
10	Write a shell script to Develop a basic math Calculator								
K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create									

CO	Course Outcomes- On the successful completion of the course, students will be able to:	Knowledge Level
1	Understand the design issues associated with operating systems	K1, K2
2	Master various process management concepts like scheduling, deadlock management	K2, K3
3	Analyze on memory management	K3, K4
4	Analyze about the disk performance optimization and file systems	K3, K4
5	Analyze on Linux operating system	K3, K4

Text books:

1	Silberschatz and Galvin, Operating System Concepts, 6th Edition, John Wiley & Sons, Inc., 2019.
2	Milankovic M., Operating System Concepts and Design, 2nd Edition, McGraw Hill, 2018.

Reference Books:

1	P.C.Bhatt, An Introduction to Operating Systems-Concepts and Practice, Prentice Hall of India, 2004.
2	H.M.Deitel, An Introduction to Operating Systems, 2nd Edition, Pearson Education, 2002.

Web Resources:

1	https://www.javatpoint.com/os-tutorial
2	https://www.tutorialspoint.com/operating_system/index.htm
3	https://nptel.ac.in/courses/106/106/106106144/

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	1	1	2	2	2	2
CO2	3	3	2	2	2	1	1	2	3	3	2
CO3	3	3	2	3	2	1	1	2	3	3	3
CO4	3	3	2	3	2	1	1	2	3	3	3
CO5	3	3	3	2	3	2	2	2	3	3	3
Total	15	14	10	11	11	7	7	10	14	14	13
Average	3	2.8	2	2.2	2.2	1.4	1.4	2	2.8	2.8	2.6

3 – Strong, 2- Medium, 1- Low

Department of Computer Applications		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCAE21	Social Media Analytics	3	2	0	3	5	25	75	100
Category	Core Course	Theory & Problem							
Learning Objectives									
LO1	Familiarize the learners with the concept of social media.								
LO2	Familiarize the learners with the concept of social media analytics and understand its significance								
LO3	Enable the learners to develop skills required for analysing the effectiveness of Social media.								
LO4	Familiarize the learners with different tools of social media analytics.								
LO5	Familiarize the learner with different visualization techniques for Social media analytics.								
Unit	Content								Hours
1	Social Media Analytics : An Overview Core Characteristics of Social Media, Types of Social Media, Social media landscape, Need for Social Media Analytics (SMA), SMA in small & large organizations. Seven Layers of Social Media Analytics, Types of Social Media Analytics, Social Media Analytics Cycle, Social Media Analytics Tools.								15
2	Social Network Structure: Measures & Visualization Basics of Social Network Structure - Nodes, Edges & Tie Describing the Networks Measures –Degree Distribution, Density, Connectivity, Centralization, Graph Layout, Scale Issues. Social Media Network Analytics-Common Network Terms, Common Social Media Network Types, Types of Networks, Common Network Terminologies, Network Analytics Tools.								15
3	Social Media Text: Action & Hyperlink Analytics Social Media Text Analytics-Types of Social Media Text, Steps in Text Analytics, Social Media Text Analysis Tools, Social Media Action Analytics What Is Actions Analytics? Actions Analytics Tools , Social Media Hyperlink Analytics: Types of Hyperlinks, Types of Hyperlink Analytics, Hyperlink Analytics Tools.								15
4	Social Media Location & Search Engine Analytics: Location Analytics - Sources of Location Data, Categories of Location Analytics, Location Analytics Tools, Search Engine Analytics-Types of Search Engines, Search Engine Analytics, Search Engine Analytics Tools								15
5	Social Information Filtering - Social Sharing and filtering Automated Recommendation systems, Traditional Vs social Recommendation Systems, Understanding Social media and Business Alignment, Social media KPI, formulating a Social Media Strategy, Managing Social Media Risks.								15
K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create									
CO	Course Outcomes- On the successful completion of the course, students will be able to:								Knowledge Level

1	Understand the concept of Social media	K2
2	To build the concept of social media Analytics and its significance	K1
3	To analyze the effectiveness of social media.	K3
4	To use different Social media analytics tools effectively and efficiently.	K3
5	To apply different effective Visualization technique store present Social media analytics	K3
Text books:		
1	Reza Zafarani Mohammad Ali Abbasi Huan Liu, Social Media Mining, Cambridge University Press, ISBN: 10: 1107018854.	
2	Charu C. Aggarwal, Social Network Data Analytics, Springer, ISBN: 978-1-4419-8461-6	
3	Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics" Author: Matthew Ganis and Avinash Kohirkar	
4	Social Media Data Mining and Analytics" Authors: Gabor Szabo and G. L. Ciampaglia	
5	"Social Media Metrics: How to Measure and Optimize Your Marketing Investment" Author: Jim Sterne	
Reference Books:		
1	Marshall Sponder, Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics, McGraw Hill Education, 978-0-07-176829-0.	
2	Matthew A. Russell, Mining the Social Web, O'Reilly, 2nd Edition, ISBN:10: 1449367615.	
3	"Social Media Mining: An Introduction" Authors: Reza Zafarani, Mohammad Ali Abbasi, and Huan Liu	
Web Resources:		
1	https://www.bing.com/videos/riverview/relatedvideo?q=social+Media+analytics+web+resources+link&mid=05D562A78D17FE262CCA05D562A78D17FE262CCA&FORM=VIRE	

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	2				2	2	1
CO2	3	3	2	2	3				3	2	2
CO3	3	3	2	3	3	1			3	3	3
CO4	3	3	2	3	3	1			3	3	3
CO5	3	3	3	2	3	2		2	3	3	3
Total	15	14	10	11	14	4		2	14	13	12
Average	3	2.8	2	2.2	2.8	0.8		0.4	2.8	2.6	2.4

3 – Strong, 2- Medium, 1- Low

Department of Computer Applications		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCAE22	Cyber Security	3	2	0	3	5	25	75	100
Category	Core Course	Theory & Problem							
Learning Objectives									
LO1	To understand the basics of Cybercrime and Computer forensics with protecting mechanism								
LO2	To explore the working principles of WLAN, Email and Smartphone along with security mechanism and guidelines								
LO3	To gain the ability to understand the importance of cyber investigations with its functioning role and learn the basics of Wi Fi and its security measures								
LO4	To understand and learn the method of seize the digital evidence								
LO5	To analyze the concepts of digital forensics with cybercrime prevention techniques								
Unit	Content								Hours
1	Introduction to Cyber Space - Introduction to Information Systems - Need for Cyber Security Introduction to Cyber Attacks - Classification of Cyber Attacks - Classification of Malware, Threats - Vulnerability Assessment – Intrusion Detection Systems – Intrus.								15
2	Introduction to User Authentication Methods - Biometric Authentication Methods - Biometric Systems - Different Security Models and Security Mechanisms - Information Security and Network Security - Operating System Security - Web Security - Email Security – Cloud Security.								15
3	IoT Security - Cyber Physical System Security - Social Media Security – (Virtual Currency - Block Chain Technology - Security Auditing)* - Cyber Crimes - Different Types of Cyber Crimes, Scams and Frauds.								15
4	Analysis of Crimes, Human Behavior - Stylometry, Incident Handling - Investigation Methods - Criminal Profiling, Cyber Trails - Digital Forensics, History, Challenges - Branches of Digital Forensics. Digital Forensic Investigation Methods – (Reporting, Management of Evidence)*								15
5	Cyber Law-Basics - Information Technology Act 2000 - Amendments to IT Act 2000 - Evidentiary value of Email/SMS, Cybercrimes and Offenses dealt with IPC - RBI Act and IPR Act in India - Jurisdiction of Cyber Crime, (Cyber Security Awareness Tips)*.								15
K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create									
CO	Course Outcomes- On the successful completion of the course, students will be able to:								Knowledge Level
1	Understand, describe, analyze and examine the basics of Cyber security concepts and its implementation in India								K1-K6
2	Comprehend and demonstrate the security tips in browsers, WLAN, social networks, Email security and Smart phone. Apply the investigations in post mortem and Forensics								K1-K6

3	Understand, apply and evaluate the various investigation roles and Wi Fi protecting mechanisms.	K1-K6
4	Understand, illustrate and evaluate the method of seize the digital information and evidences forensics data and evaluate the forensics reports	K1-K6
5	Comprehend, apply and appraise the methods digital forensics with cybercrime prevention techniques	K1-K6

Text books:

1	Cybersecurity and Cyberwar: What Everyone Needs to Know, P.W. Singer & Allan Friedman, Oxford University Press, 2024
2	Cybersecurity and Cybercrime: An Introduction (2nd Edition), Thomas J. Holt, Adam M. Bossler, Kathryn C. Seigfried-Spellar, Routledge, 2023 (Latest Edition).
3	Charles J. Brooks, Christopher Grow, Philip Craig Donald Short, “Cybersecurity Essentials”, (2018), John wiley and sons.
4	Cyber Law: The Indian Perspective”, Pavan Duggal, LexisNexis India, 5th Edition (2023)

Reference Books:

1	Sebastian Klipper, —Cyber Security Ein Einblickfur Wirtschafts wissens chaftler Fachmedien Wiesbaden,2015
2	John G.Voller Black and Veatch, —Cyber Security Published by John Wiley & Sons, Inc., Hoboken, New Jersey Published simultaneously in Canada ©2014.
3	Lester Evans, “Cyber security: An Essential Guide to Computer and Cyber Security for Beginners, Including Ethical Hacking, Risk Assessment, Social Engineering, Attack and Defense Strategies, and Cyber warfare”, John Wiley and Sons.

Web Resources:

1	https://www.bing.com/videos/riverview/relatedvideo?q=social+Media+analytics+web+resources+link&mid=05D562A78D17FE262CCA05D562A78D17FE262CCA&FORM=VIRE
2	https://innovationatwork.ieee.org/organizations/cyber-security/
3	https://online.stanford.edu/computer-science-security/courses-and-programs

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	2	1		1	2	2	2
CO2	3	3	2	2	3	1		1	3	3	2
CO3	3	3	2	3	3	2		2	3	3	3
CO4	3	3	2	3	3	2		2	3	3	3
CO5	3	3	2	2	2	3		3	2	2	3
Total	15	14	9	11	11	9		9	11	11	11
Average	3	2.8	1.8	2.2	2.2	1.8		1.8	2.2	2.2	2.2

3 – Strong, 2- Medium, 1- Low

Department of Computer Applications		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCAE23	BigData Analytics	3	2	0	3	5	25	75	100
Category	Core Course	Theory & Problem							
Learning Objectives									
LO1	To introduce big data tools & Information Standard formats.								
LO2	To understand the basic concepts of big data.								
LO3	To learn Hadoop, HDFS and Map Reduce concepts.								
LO4	To teach the importance of NoSQL.								
LO5	To explore the big data tools such as Hive, HBase and Pig.								
Unit	Content								Hours
1	Big Data and Analytics: Classification of Digital Data: Structured Data- Semi Structured Data and Unstructured Data. Introduction to Big Data: Characteristics – Evolution – Definition - Challenges with Big Data - Other Characteristics of Data - Big Data - Traditional Business Intelligence versus Big Data - Data Warehouse and Hadoop.								15
2	Technology Landscape: NoSQL, Comparison of SQL and NoSQL, Hadoop RDBMS Versus Hadoop - Distributed Computing Challenges – Hadoop Overview - Hadoop Distributed File System - Processing Data with Hadoop - Managing Resources and Applications with Hadoop YARN - Interacting with Hadoop Ecosystem								16
3	Mongodb and Mapreduce Programming: MongoDB: Mongo DB - Terms used in RDBMS and Mongo DB - Data Types - MongoDB Query Language. MapReduce: Mapper – Reducer – Combiner – Partitioner – Searching – Sorting – Compression								15
4	Hive: Introduction – Architecture - Data Types - File Formats - Hive Query Language Statements – Partitions – Bucketing – Views - Sub- Query – Joins – Aggregations - Group by and Having – RCFile - Implementation - Hive User Defined Function - Serialization and Deserialization.								15
5	Pig: Introduction - Anatomy – Features – Philosophy - Use Case for Pig - Pig Latin Overview - Pig Primitive Data Types - Running Pig - Execution Modes of Pig - HDFS Commands - Relational Operators - Eval Function - Complex Data Types - Piggy Bank - User-Defined Functions - Parameter Substitution – Diagnostic Operator - Word Count Example using Pig - Pig at Yahoo! - Pig Versus Hive								14
K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create									
CO	Course Outcomes-								Knowledge Level
On the successful completion of the course, students will be able to:									
1	To understand, illustrate and evaluate the concepts and techniques of Data Science, Big Data Analytics and its tools								K1-K6
2	To collaborate, apply and review the computing for big data in Hadoop, and NoSQL environment.								K1-K6
3	To comprehend, implement and review the concepts of data science and big data analytics projects using MapReduce, and MongoDB								K1-K6

4	To understand, use and analyze the concepts of big data analytics projects using HIVE database.	K1-K6
5	To illustrate, develop and review the concepts of PIG K1-K6 database in Hadoop environment.	K1-K6
Text books:		
1	Seema Acharya, Subhashini Chellappan, —Big Data and Analytics, Wiley Publications, First Edition, 2015	
2	Judith Huruwitz, Alan Nugent, Fern Halper, Marcia Kaufman, —Big data for dummies, John Wiley & Sons, Inc. (2013)	
3	Tom White, —Hadoop The Definitive Guide, O'Reilly Publications, Fourth Edition, 2015	
4	Dirk Deroos, Paul C.Zikopoulos, Roman B.Melnky, Bruce Brown, Rafael Coss, —Hadoop For Dummies, Wiley Publications, 2014	
Reference Books:		
1	Robert D.Schneider, —Hadoop For Dummies, John Wiley & Sons, Inc. (2012)	
2	Paul Zikopoulos, —Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw Hill, 2012 Chuck Lam, —Hadoop In Action, Dreamtech Publication	
Web Resources:		
1	https://www.mygreatlearning.com/academy/learn-for-free/courses/mastering-big-data-analytics	
2	https://nptel.ac.in/courses/106104189	

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	1	1	2		1	1	2	2	1
CO2	3	3	2	2	3		1	1	3	3	2
CO3	3	3	3	2	3	1	1	1	3	3	3
CO4	3	3	3	3	3	1	1	1	3	3	3
CO5	3	3	3	3	3	1	2	2	3	3	3
Total	15	14	12	11	14	3	6	6	14	14	12
Average	3	2.8	2.4	2.2	2.8	1	1.2	1.2	2.8	2.8	2.4

3 – Strong, 2- Medium, 1- Low

Department of Computer Applications		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCAE24	Cryptography & Information Security	3	2	0	3	5	25	75	100
Category	Core Course	Theory & Problem							
Learning Objectives									
LO1	To familiarize classical encryption techniques and advanced encryption standards								
LO2	To explore the working principles and utilities of various cryptographic algorithms including secret key cryptography, hashes and message digests, and public key algorithms								
LO3	To recognize different encryption and decryption techniques to solve problems related to confidentiality and authentication								
LO4	To develop the ability to use existing cryptographic utilities to build programs for secure communication.								
LO5	To learn the need of digital signatures to secure the document with key management								
Unit	Content								Hours
1	Overview: Computer Security Concepts – The OSI Security Architecture – Security Attacks – Security Services – Security Mechanisms –A Model for Network Security – Classical Encryption Techniques: Symmetric Cipher Model – Substitution Techniques – Transposition Techniques – Rotor Machines – Steganography.								15
2	Block Ciphers and the Data Encryption Standard: Traditional Block Cipher Structure –The Data Encryption Standard – The DES Example – The Strength of DES – Block Cipher Design Principles –Basic Concepts in Number Theory and Finite Fields: Divisibility and the Division Algorithm – The Euclidean Algorithm – Modular Arithmetic – Groups, Rings, and Fields – Finite Fields of the Form GF(p) – Polynomial Arithmetic.								15
3	Advanced Encryption Standard: Finite Field Arithmetic– AES Structure – AES Transformation Functions – AES Key Expansion –Block Cipher Operation: Multiple Encryption and Triple DES – Stream Ciphers – RC4 – Public-Key Cryptography and RSA: Principles of Public-Key Cryptosystems – The RSA Algorithm –Diffe -Hellman Key Exchange – Elgamal Cryptographic System – Elliptic Curve Arithmetic – Elliptic Curve Cryptography – Pseudorandom Number Generation Based on an Asymmetric Cipher.								15
4	Cryptographic Hash Functions: Applications of Cryptographic Hash Functions – Two Simple Hash Functions – Requirements and Security – Hash Functions Based on Cipher Block Chaining – Secure Hash Algorithm(SHA) – SHA-3 – Message Authentication Codes: Requirements – Functions – Security of MACs – MACs Based on Hash Functions: HMAC – MACs based on Block Ciphers: DAA and CMAC – Authenticated Encryption: CCM and GCM – Key Wrapping.								15
5	Digital Signatures – Elgamal Digital Signature Scheme – Schnorr Digital Signature Scheme – NIST Digital Signature Algorithm – Elliptic Curve Digital Signature Algorithm – RSA-PSS Digital Signature Algorithm – Key Management and Distribution: Symmetric Key Distribution Using Symmetric Encryption – Symmetric Key Distribution Using Asymmetric Encryption – Distribution of Public Keys – X.509 Certificates – Public-Key Infrastructure.								15
K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create									

CO	Course Outcomes- On the successful completion of the course, students will be able to:	Knowledge Level
1	Comprehend and analyze the security concepts to apply and evaluate the encryption techniques in various models	K1-K6
2	Understand and examine the various data encryption standards and number theory. Illustrate and evaluate the various techniques in different applications	K1-K6
3	Grasp the knowledge of AES techniques and apply to evaluate the performance with different key types	K1-K6
4	Comprehend and analyse the basics of hash function and MAC that helps to develop the encryption models in various application	K1-K6
5	Understand and illustrate the need of digital signature to examine the method of providing good security to the document. And also learn the concept of key management	K1-K6

Text books:

1	William Stallings, —Cryptography and Network Security – Principles and Practices, Pearson Education / PHI, 7th Edition.
2	Behrouz A Forouzan, Debdeep Mukhopadhyay, —Cryptography And Network Security, McGraw Hill Education, 3rd Edition.
3	C.K. Shyamala, N. Harini, Dr. T. R. Padmanabhan, —Cryptography and Security, Wiley India Pvt. Ltd., 2011

Reference Books:

1	Bernard Menezes, —Network Security and Cryptography, Cengage, 1st Edition, 2010.
2	William Stallings, —Cryptography and Network Security, Pearson Education India, Sixth Edition, 2016.
3	V.K. Jain, —Cryptography and Network Security, Khanna Book Publishing, New Delhi, 2016.

Web Resources:

1	https://www.youtube.com/watch?v=j_8PLI_wCVU
2	https://onlinecourses.nptel.ac.in/noc25_cs16/preview

Mapping with Programme Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	3	2	2	3	3	3	1	3	3	2
CO2	3	3	3	3	3	2	2	3	3	3	3
CO3	2	3	3	2	1	3	3	3	2	3	3
CO4	3	2	3	3	3	1	2	2	3	2	3
CO5	3	2	2	2	3	3	3	2	3	2	2
Total	14	13	13	12	13	12	12	11	14	13	14
Average	2.5	2.6	2.6	2.4	2.6	2.4	2.4	2.2	2.8	2.6	2.8

3 – Strong, 2- Medium, 1- Low

Department of Computer Applications		L	T	P	Credits	Hours	Marks		
Regulation 2026-27							CIA	ESE	Total
Course Code	Title of the Course								
26PCAS21	Advanced Web Technologies	2	0	1	2	3	25	75	100
Category	Core Course	Theory & Problem							
Learning Objectives									
LO1	Provide knowledge on some basic tags of HTML.								
LO2	Impart skills to execute simple web pages using HTML and CSS.								
LO3	Familiarize the concepts to design layouts using advanced CSS techniques.								
LO4	Impart knowledge to develop dynamic documents using JavaScript with CSS.								
LO5	Disseminate knowledge to create dynamic web pages using PHP, MySQL and connection to a server.								
Unit	Content								Hours
1	HTML Syntax, Semantic Markup, Structure of HTML Documents: DOCTYPE, Head and Body, HTML Elements: Headings, Paragraphs and Divisions, Links, URL Relative Referencing, Inline Text Elements, Images, Character Entities, Lists, HTML5 Semantic Structure Elements: Header and Footer, Heading Groups, Navigation, Articles and Sections. Introducing Tables, Forms, Form Control elements, Table and Form accessibility.								9
2	Define CSS. Benefits of CSS, CSS Syntax: Selectors, Properties, Values, Location of Styles: Inline Styles, Embedded Style Sheet, External Style Sheet. Selectors: Element Selectors, Class Selectors, Id Selectors, Attribute Selectors, Pseudo-Element and Pseudo-Class Selectors, Contextual Selectors. The Cascade: How Styles Interact, The Box Model, CSS Text Styling.								9
3	Normal Flow, Positioning Elements: Relative Positioning, Absolute Positioning. Floating Elements: Floating within a Container, Floating Multiple Items Side by Side, Containing Floats, Overlaying and Hiding Elements. Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks.								9
4	JavaScript: Client-Side Scripting, JavaScript's History and Uses. JavaScript Design Principles, Inline JavaScript, Embedded JavaScript, External JavaScript, Advanced Inclusion of JavaScript. Syntax: Variables, Comparison Operators, Logical Operators, Conditionals, Loops, Functions, Errors Using Try and Catch. JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms: Validating Forms, Submitting Forms.								9
5	PHP: PHP Tags, PHP Comments, Variables, Data Types, and Constants, Writing to Output. Program Control, Functions, Arrays, \$_GET and \$_POST Super global Arrays, \$_SERVER Array, \$_FILES Array. Databases and Web Development, SQL, Database APIs, Managing a MySQL Database, Accessing MySQL in PHP.								9
K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create									
CO	Course Outcomes-								Knowledge Level
	On the successful completion of the course, students will be able to:								

1	Utilize foundational HTML tags in web pages.	K3
2	Build static web pages with a combination of HTML for structure and CSS for styling.	K5
3	Identify complex and responsive layouts that adapt to different screen sizes.	K3
4	Make use of Document Object Model (DOM) in JavaScript to add, remove, or modify the content of your web pages.	K4
5	Build dynamic web pages that interact with databases using PHP, a server-side scripting language.	K5

Text books:

1	Harvey Deitel, Abbey Deitel, “Internet & World Wide Web –How to Program”, Fifth Edition, Pearson Education, 2020.
2	Matt Frisbie, “Professional JavaScript for Web Developers”, Wiley Publishing Inc, Fourth Edition, 2019.
3	Thomas A Powell, Fritz Schneider, “JavaScript: The Complete Reference”, 3rd Edition, Tata McGraw Hill, 2013.
4	Pedro Telxeira, “Professional Node.js: Building JavaScript Based Scalable Software”, John Wiley & Sons Inc., 2013.
5	Alex Banks, Eve Porcello, "Learning React", O'Reilly Media, Inc, 2nd Edition, 2020.

Reference Books:

1	Vasan Subramanian, ‘Pro MERN Stack, Full Stack Web App Development with Mongo, Express, React, and Node’, Second Edition, Apress, 2019
2	DT Editorial Services, “HTML 5 Black Book”, Dream Tech Publishers, 2016.
3	Kogent Learning Solutions Inc., “Web Technologies: Black Book”, Dream Tech Publishers, 2009
4	John Dean, “Web Programming”, Jones & Barlett Learning, 2019.

Web Resources:

1	https://www.udemy.com/course/html5-from-basics-to-advanced-web-development/?utm_source=chatgpt.com
2	Advance PHP web development training PHP Mysql course

Mapping with Program me Outcomes and Programme Specific Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PSO1	PSO2	PSO3
CO1	3	2	2	1	3		1	1	3	2	1
CO2	3	3	3	2	3		2	2	3	3	1
CO3	3	3	3	2	3		2	2	3	3	2
CO4	3	3	3	2	3	1	2	2	3	3	2
CO5	3	3	3	3	3	1	2	2	3	3	3
Total	15	14	14	10	15	2	9	9	15	14	9
Average	3	2.8	2.8	2	3	0.4	1.8	1.8	3	2.8	1.8

3 – Strong, 2- Medium, 1- Low